Control/Tracking Number : 1781287
Activity : Research Contributed

Title:
Insights into Collisional between Small Bodies: Comparison of Impacted Magnesium-rich Minerals

Author Block:
Susan M. Lederer[1], E. A. Jensen[2], C. Strojia[3], D. C. Smith[3], L. P. Keller[1], K. Nakamura-Messenger[4], E. L. Berger[1], S. S. Lindsay[5], D. H. Wooden[6], M. J. Cintala[1], M. E. Zolensky[1]
[1]NASA Johnson Space Center, [2]Planetary Science Institute, [3]California State Univ. S.B., [4]JETS Jacobs Technology, [5]Univ. of Tenn., [6]NASA Ames Research Center

Abstract:
Impacts are sustained by comets and asteroids throughout their lives, especially early in the Solar system's history, as described by the Nice model. Identifying observable properties that may be altered due to impacts can lead to a better understanding their collisional histories. Here, we investigate spectral effects and physical shock features observed in infrared spectra and Transmission Electron Microscope (TEM) images, respectively, of magnesium-rich minerals subjected to shock through impact experiments. Samples of magnesium-rich forsterite (Mg_2SiO_4, olivine), orthoenstatite (Mg_2SiO_3, pyroxene), diopside ($MgCaSi_2O_6$, monoclinic pyroxene), and magnesite ($MgCO_3$, carbonate) were impacted at speeds of 2.4 km/s, 2.6 km/s and 2.8 km/s. Impact experiments were conducted in the Johnson Space Center Experimental Impact Laboratory using the vertical gun. Clear signatures are observed in both the mid-IR spectra (shift in wavelengths of the spectral peaks and relative amplitude changes) of all minerals except magnesite, and in TEM images (planar dislocations) of both the forsterite and orthoenstatite samples. Further discussion on forsterite and enstatite analyses can be found in Jensen et al., this meeting.

Funding was provided by the NASA PG&G grant 09-PGG09-0115, NSF grant AST-1010012, and a Cottrell College Scholarship through the Research Corporation.

Category:
Asteroids, Comets